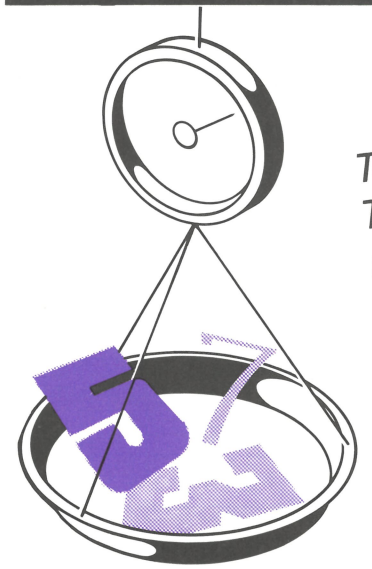
MATH SHOP™



Ten Challenging Simulations That Help Students Apply Essential Math Skills

By Cary Hammer

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GUIDE TO THE PROGRAM

What's in Store for You?

The shops in the Math Shop Mall are at a stand-still. Frantic, fuzzy-headed storeowners aren't able to provide good service for their customers. The druggist at the pharmacy is having trouble making each prescription just right, and the baker needs help dividing up donut orders. In fact, all ten storeowners are in need of a math-minded assistant like you! Put your arithmetic skills to work as you solve some very interesting problems, and lend a hand to help keep the Math Shops in business.

Where does the work begin? You can start by working on the first floor, packing bags at the grocery store. Or step up to the cash register at the boutique and ring up some sales. Perhaps you'd rather deal with eggs at the dairy. It's your choice. When you've had some experience, take the elevator up to the shops on the second and third floors for challenges in computer-fixing, cereal-mixing, and more.

You'll receive plenty of on-the-job training at each store. Some shops will have easy work for you to do. Other shops will give you more time-consuming tasks. In each store, the challenge will increase as your skills improve.

Work in the Math Shops can be scheduled as you like. In the "One Shop" game, you can work as long as you like, serving as many customers as you please. Or work against the clock - from 9:00 to 5:00 - to serve as many customers as you can during normal "shopping hours."

When you've gained some experience in each of the Math Shops, try the "All Shops" game. Customers will be waiting for your help at all ten stores. You'll really have to keep moving! Serve as many customers as quickly as you can so that the lines don't get too long. With good work, you may even earn the honor of putting your name on the list of Top Employees! What a way to launch your career!

Getting Started

Equipment You Need

- Apple® II Plus (64K), *II*e, or IIc
- One disk drive and monitor (or TV)

Loading *Math Shop* Into Your Computer

1. Insert the *Math Shop* disk, label facing up, into the drive, and close the drive door.
2. Turn on the monitor or TV and the computer.
3. The disk drive will make some working noises as *Math Shop* loads into the computer. Do not remove the disk while the drive's red light is on.
4. Follow the instructions on the screen to remove the disk. Then turn it over to Side 2 (label facing down), reinsert it, and press Return.
5. After the program has loaded, you will see the Math Shop Mall and this choice: "To open one shop at a time, press O. To open all of the shops, press A." Information on the *Math Shop* game options is contained in the pages that follow.

Getting to Know *Math Shop*

Read through this manual for step-by-step examples of how to serve customers at each Math Shop. Each shop is very different. Browsing through the shops in the manual is a good way to decide where and how to work when you start on the computer.

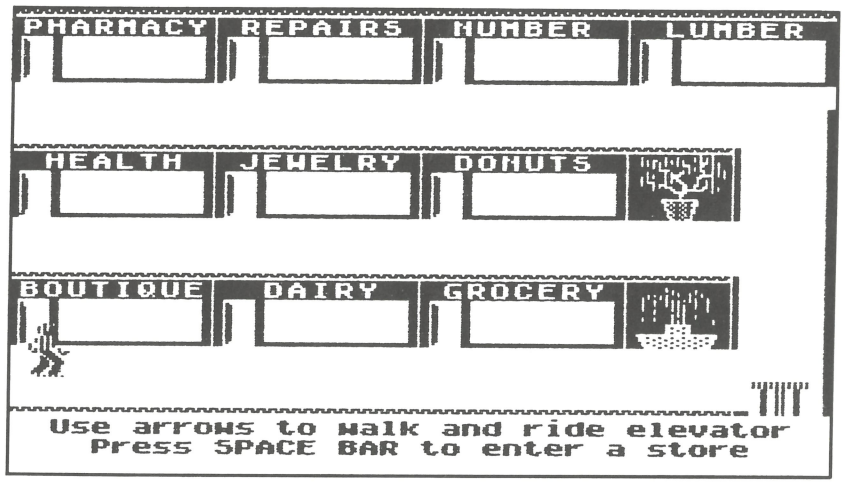
But don't wait too long to start working. Your help is needed in every shop. You will probably find it easiest to stay on the first floor and work at the boutique, grocery, or dairy. When you enter a store, you can get instructions by pressing the I key. The other important keys are discussed on page 6 and are also listed on the Reference Card included in your *Math Shop* package. Keep this card next to your computer as you start to work in the shops.

Keys to Know

- *To walk:* Press → or ← on the *IIe* or IIc or J and K on the II Plus to walk right and left.
- *To ride the elevator:* Press ↑ or ↓ on the *IIe* and IIc or I and M on the II Plus to ride the elevator up and down.
- *To enter a shop:* Move to the front of the shop, and then press the Space Bar.
- *To move the arrow:* Press Return or → to move the cursor forward and ← to move the arrow backward.
- *To enter numbers:* Type the number and press Return.
- *To erase mistakes:* Press Delete or ← .
- *To serve a customer:* After you have entered the answer(s), press the Space Bar to serve the customer. If you've answered correctly, the next customer will step up for service. If not, you'll get to try again.
- *To leave a store:* Press Esc when you want to leave a store.
- *To quit:* If you're playing the One Shop game, leaving the store by pressing Esc will end the game. If you're playing the All Shops game, pressing Esc while you're at the mall will end the game.
- *To switch games:* If *Math Shop* is set to the One Shop game and you want to turn the clock on or off or switch to the All Shops game, go to the mall. Then press Esc. You will then see your game choices on the bottom of the screen.
- *To turn the sound on or off:* Press Ctrl-S (hold down the Control key and press the S key) to turn the sound off. Press Ctrl-S again to turn the sound back on.
- *To erase the list of high scores:* At the mall, hold down the Ctrl key and press the C key to erase the list of Top Employees.

Choosing a Game

After loading the program, you will see the Math Shop Mall on your screen:



At the mall, you have a choice. You can open one shop only or you can open all ten shops. If you open only one shop, you'll have a second choice: you can work with a clock or without a clock.

Follow these steps to choose a game:

1. At the Math Shop Mall, press O to open one shop or A to open all the shops.
2. If you press O you'll see the question, "Do you want to work against the clock? Y/N."

   Press N (for No) to get unlimited time to work at the stores. This is the One Shop game without the clock.

   Press Y (for Yes) to set up the clock. This is the One Shop game with the clock.

   If you press A, you will see customers in the shops, waiting to be served. This is the All Shops game.
3. Walk or ride the elevator to the shop of your choice. Press the Space Bar to go inside. Now you're ready to start. Once inside the shop, press S to start working or press I to get instructions.

Read the sections that follow to learn about the different *Math Shop* games and how to switch between them.

Switching Games

If you have been playing the One Shop game and you want to switch to the All Shops game, or vice versa, press Esc to leave the store you're in. You'll return to the Math Shop Mall. At the mall, press Esc once more to choose the game and clock option set-up again. Follow the "Choosing a Game" instructions to set up the game. If you do not want to switch game options, do not press Esc at the mall to start over.

The One Shop Game Without the Clock

If you are new to *Math Shop*, start by choosing the One Shop game without the clock. In this game you go into one store and serve customers at your own pace. Continue working at the store for as long as you want. The game ends when you press Esc to leave the shop.

When you enter a shop, you'll see "Customers Served" at the top of the screen. This will keep track of the number of customers you've served correctly (or number of problems you've solved correctly).

Serving Customers

In this game, you don't need to hurry. Each customer will wait patiently until you correctly answer the request. If you enter an incorrect answer, you'll see a helpful message at the bottom of the screen. Read this message, look at your mistake carefully, and then try to correct it in your new answer. Entering "educated guesses" or estimates of the answer is a good way to learn about solving the problem. Keep at it, and refer to the examples in this manual for additional information about each store.

After you've correctly served a customer, you'll move on to the next one. You can continue working until you want to quit or move to another store. Press Esc to leave the store and go back into the mall.

The One Shop Game With the Clock

If you'd like to work with a time limit, try working at a store while the clock is running. In this game, the goal is to serve as many customers as you can during the normal "shop hours" from 9:00 to 5:00. At the top of the screen, you'll see a number labeled "Customers Served," which keeps track of your score, and the clock, which keeps track of the time.

You'll notice that the "minutes" tick away very quickly. (The actual time from "9:00 to 5:00" is approximately 5 minutes.) Once 5:00 comes around, the store automatically closes and your score will appear on the screen. You'll get one point for each customer you've served during the game. Make a note of your score on the Customer Service score card, and try to work even faster the next time you work in that shop.

The All Shops Game

In the All Shops game, you'll start at the mall. Notice that the top of the screen says "Customers Served" and "Customers Lost." These are important numbers to keep track of. "Customers Served" shows you the total number of customers you've served in all of the shops you've worked in. When you end the game, this will be your final score. "Customers Lost" shows the number of impatient customers that have left a store because they waited in line too long without being served.

At the mall, you'll also notice that there are customers waiting to be served in many of the shops. All shops are open for business in the All Shops game, and more customers will arrive as you work. As everyone knows, customers don't like to wait in lines, especially in crowded stores. You'll have to work as quickly as you can because the impatient customers will leave if the lines get too long. The game will end when 50 customers have left.

To start working, follow the instructions on page 6 to enter one of the shops. Once you are inside a shop, you'll see "Customers Waiting" at the top of the screen. This tells you the number of customers in this store. Since you can only work in a store as long as there are customers to serve, you will automatically return to the mall when the "Customers Waiting" number reaches zero. However, you do not have to serve all of the customers in line. You can return to the mall at any time just by pressing Esc.

As you continue to serve customers in the store, their orders will become more difficult. You can leave a store without serving a particular customer, but when you return, the demands of the new customers will be on the same level. The problem will be just as challenging as it was when you left the store.

Customers Lost

A store will become overcrowded when the tenth customer arrives. At that point all 10 customers will lose their patience, and they will all leave the store. But don't worry. This is bound to happen fairly frequently. After all, how can you possibly serve all of the customers in an entire mall by yourself? Besides, new customers will always arrive at the store. In the meantime, there are many more customers needing help at the other nine shops. Just work as quickly as you can to serve as many customers as you can before the end of the game.

How the Game Ends

At some point, no matter how good you are at this game, you will find that customers are arriving at stores faster than you can serve them. Eventually the "Customers Lost" number will reach 50. This signals the end of the game. The score screen will show you how many customers you served at each of the ten stores.

If you've done exceptional work, you may get to enter your name on the list of Top Employees. The ten highest scorers will make this list. If at any time you want to erase the list and start a new record of the top scores, you can do so. At the mall screen, Press Ctrl-C. This will clear the list and make room for ten new scores.

Tips for Playing the All Shops Game

Here are some playing strategies:

1. Head for the most crowded stores first. The more customers there are waiting in a line, the closer the store is to being overcrowded.
2. Don't waste a lot of time taking long walks from one end of the mall to the other. Walking from store to store uses up precious time - time that could be spent working! So, unless there are large crowds elsewhere, you'll probably want to attend to the nearby stores first.
3. Serve at least a few of the customers at each shop, even if you think some shops are more difficult than others. Remember, at any shop, the first customers are the easiest ones to serve. Even if you serve only three customers, you will delay overcrowding. This will give you more time to help in the other, easier stores.
4. Just because a store overcrowds, it doesn't mean that you can't work there again. More customers will arrive, eager to be served.
5. A store can never overcrowd while you're working there. So, you can let a store line build up to nine customers, and if you arrive at that store before the tenth customer, you can stay there and work without worrying that it will overcrowd while you're there.
6. As you play the All Shops game, write down the names of the stores that give you trouble. Then switch to the One Shop game, and choose each of those stores for practice. After a few practice sessions, try the All Shops game again. You should find that your score improves.

GUIDE TO THE MATH SHOPS

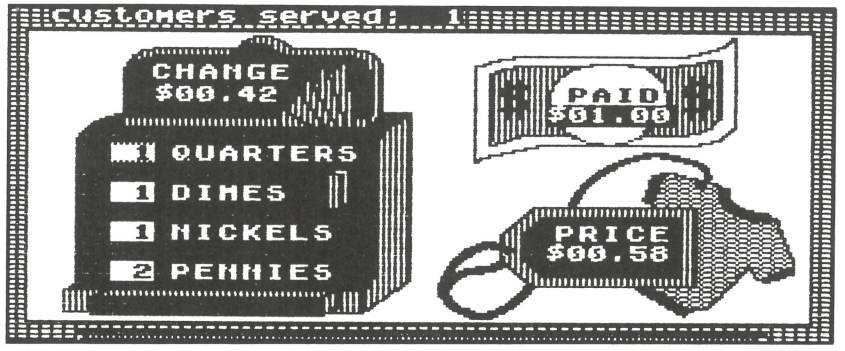
The Boutique

In Manny's Bargain Boutique, T-shirts are the popular item. Customers are lined up to pay for their top choices. The problem is, the cashier hasn't arrived, and there's no one available to handle the cash register. This is where you come in.

Your Job

Please accept the job of cashier, and have some fun ringing up the sales. Your job is to give customers their change using the fewest coins possible. You'll have to hand out a lot of quarters, dimes, nickels, and pennies - especially since there are no dollar bills left in the cash register!

This is how you'll work at the boutique:



What Happens

The customer will hand you some money, which you'll see in the dollar bill (in this case, $1.00). The price tag on the T-shirt will show its cost. (In the example above, it's a bargain at 58 cents.) Your job is to figure out how many quarters, nickels, dimes, and pennies to give as change.

What You Figure Out

How much change should you give? And how many of each coin should you use? Remember, you must use as few coins as possible.

What You Do

Next to the name of each coin listed on the cash register, type in the quantity you want to give to the customer. For example, if you want to give the customer one quarter, type **1** in the box next to Quarters. Then press Return. The display on the top of the cash register will show the total value of the coins you've selected. When you're ready, press the Space Bar to give the change to the customer.

Checking Your Work

For this customer, 42 cents is the correct change. The fewest number of coins that add up to 42 cents are: 1 quarter, 1 dime, 1 nickel, and 2 pennies.

What Else Is in Store?

After the first few customers, you'll notice some higher prices on the T-shirts. Although you'll give change for $1 bills at first, the customers will soon begin giving you $5 and $10 bills.

Job Skills

Calculating the value of coins
Adding and subtracting decimals

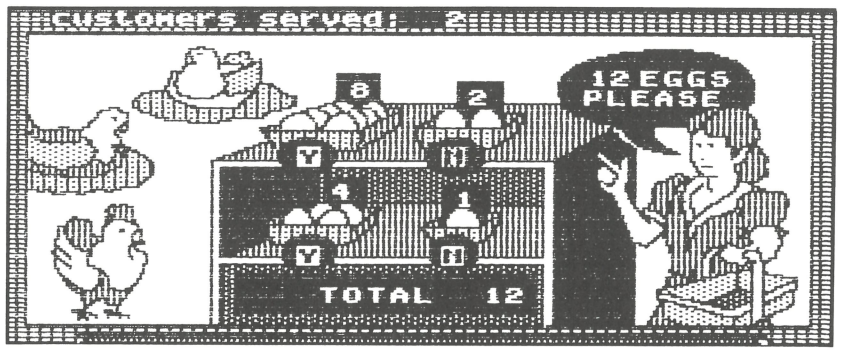
The Dairy

At The Eggland Dairy, eggs are sold by the carton. To save money, the dairy uses surplus cartons of very strange sizes! Although he's a good egg, the clerk at the dairy gets the orders a bit scrambled up. Please help him choose the right sizes of cartons for each customer.

Your Job

You'll have to make sure that each customer gets the egg-sact number of eggs she needs, no more, no less. One more requirement: you must use as few cartons as possible!

This customer's eggs were handled correctly:



What Happens

On the right side of the screen, you'll see a customer asking for a certain number of eggs. The customer in the example needs exactly 12 eggs. On the shelves, you'll see the egg cartons you have on hand. In the example, there are four egg cartons on the shelves, in 8-egg, 4-egg, 2-egg, and 1-egg sizes.

What You Figure Out
Which egg cartons should you use to fill your customer's order?

What You Do
To select a carton, type **Y** (for Yes) in the space underneath that carton. Type **N** (for No) under each carton that you do not need. To fill the 12-egg order shown here, you would need two cartons - one 8-egg carton and one 4-egg carton. Press Return after each Y or N, and press the Space Bar when you are ready to give the cartons to the customer.

Checking Your Work
The total on the bottom of the shelves will display the number of eggs contained in all the cartons you've chosen. In this example, you see a total of 12 eggs. This number should match your customer's request. When it does, press the Space Bar to serve the customer.

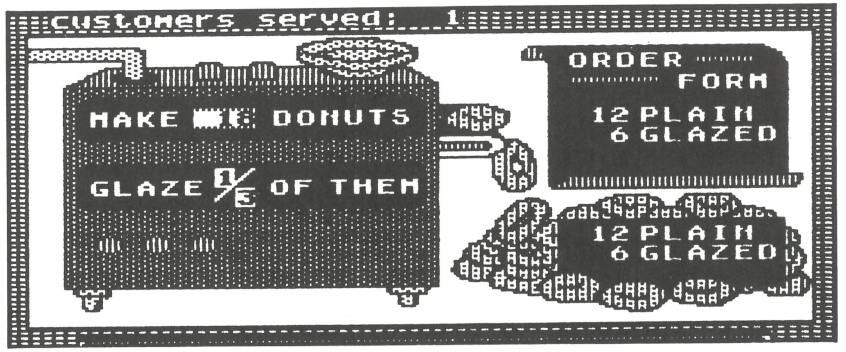
What Else Is in Store?
After you've filled a few orders, the customers will ask for larger numbers of eggs. You'll find that you have 16-egg and 32-egg cartons on your shelves.

Job Skills
Adding whole numbers
Working with binary numbers (base 2)

The Donut Shop
At Alice's Palace of Donuts, there is a snazzy new donut-making machine - a machine that bakes, glazes, and fills donuts. But a lot of dough has gone to waste because no one can operate the machine properly. A donut technician is needed immediately!

Your Job
You must adjust the donut-making machine so that it's properly set for each order.

Here's one customer's order:



What Happens
On the right side of the screen, you'll find the Order Form. It lists your customer's needs. In the example shown, a customer wants 12 plain donuts and 6 glazed donuts.

What You Figure Out
How many donuts are needed to fill the order? What part (fraction) of the donut order should be glazed?

What You Do

On the top panel of the donut-making machine, type in the total number of donuts you will need to fill the order. In the example, 12 plain + 6 glazed = 18 donuts needed.

Then type in the fractional part of the donut order that needs special treatment (in this case, glazing). Type in the fraction, numerator first. Press Return. Then type in the denominator and press Return. The machine will only accept fractions reduced to their lowest terms. In this example, one third (6 out of 18) of the donuts need to be glazed.

You only need to set the machine to make the "special" donuts. The rest of the donuts will automatically be plain. The sign on top of the finished donuts will identify them. In this illustration, it shows that 12 plain and 6 glazed donuts were produced. Once you've entered the machine settings, press the Space Bar.

Checking Your Work

Make sure that the sign over the new donuts matches the Order Form above it. In the example, 12 plain donuts and 6 glazed donuts show up in both places. If they match, then you know that the machine settings are correct.

You should know that the machine will produce whole donuts only. If you set it to make 9 donuts and to glaze half of them, it will produce 4 glazed and 5 plain donuts.

What Else Is in Store?

The first few customers will ask for plain and glazed donuts. Before too long, though, you'll be getting more complicated orders. Customers will ask for a combination of plain, glazed, and filled donuts.

Job Skills

Expressing fractions in lowest terms
Understanding ratio and proportion

The Grocery Store

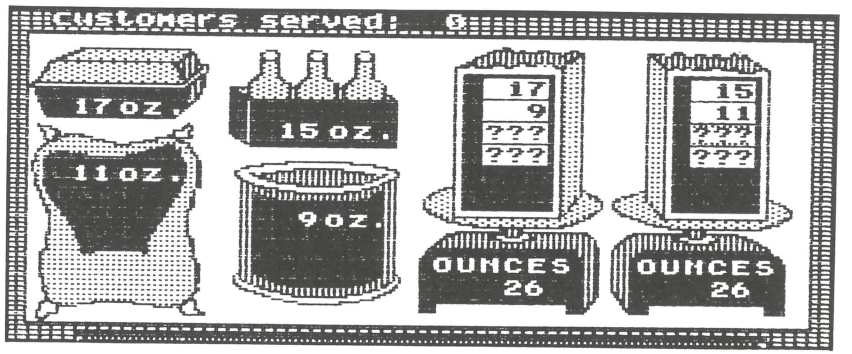
At Karen's Groceries, the cashier is having a tough time packing the bags properly. If one bag is heavier than the other, topsy-turvy customers can't carry them home.

One level-headed assistant is needed, and the job is available immediately!

Your Job

You're hired! Assist the cashier by packing each customer's groceries into two bags, so that both bags weigh the same.

In the example below, this customer's groceries are perfectly packed:



What Happens

On the left, you will see the groceries. In the example above, there are four different items. The weight of each item is shown on the label. The items shown weigh 17 ounces, 15 ounces, 11 ounces, and 9 ounces. On the right, you will see two empty grocery bags resting on scales. At first, the scales will read 0 ounces each.

What You Figure Out

Which items should you put into each bag so both bags weigh the same?

What You Do

In the empty spaces in each bag, type the weights of the items that belong in that bag. Press Return after typing each weight. All four empty spaces in a bag do not need to be filled. For the customer in the example, packing the 17-ounce box with the 9-ounce can on the left side, and the 15-ounce carton with the 11-ounce sack on the right side did the trick. Press the Space Bar when you are ready to give the balanced bags to the customer.

Checking Your Work

Make sure the weights shown on the scales are equal. In the example, the scales show a perfect balance of 26 ounces each.

What Else Is in Store?

After a few customers with four items each, customers with five and six items will appear. Get ready for a serious balancing act!

Job Skills

Adding and subtracting whole numbers
Estimating

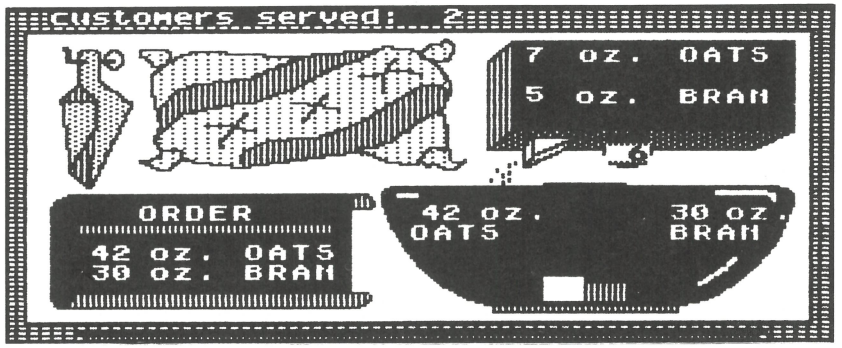
The Health Food Store

At Crunchee Health Foods, you'll meet some very finicky eaters. Each of the customers wants a precise mixture of oats and bran for their breakfast cereal. But the cereal must not be too crunchy, and certainly not too chewy! See if you can figure out what's mixed-up at this store!

Your Job

You serve customers by carefully selecting the right amounts of oats and bran to mix for each customer's cereal.

Here's a look at one satisfied customer:



What Happens

Look on the left side of the screen for the order. The customer in the example would like 42 ounces of oats and 30 ounces of bran to chew on. On the top of the screen, you'll see what brands of cereal you have in stock. In the example, you have only one brand of cereal to work with. The label shows that each box contains 7 ounces of oats and 5 ounces of bran.

What You Figure Out
To fill this customer's order, how many boxes of cereal should you pour into the bowl?

What You Do
Underneath the box, type in the number of boxes needed to provide the proper amounts of oats and bran. Press Return. After you've typed in a number, the mixing bowl displays the total amount of oats and bran provided by the boxes. In the example, the answer is 6. That means you need six of the 7-ounce boxes of oats and six of the 5-ounce boxes of bran to equal the order of 42 ounces of oats and 30 ounces of bran.

Checking Your Work
To serve a customer properly, the numbers in the mixing bowl must match those on the order. As you add cereal to the bowl, watch the two bars rise and fall. These bars illustrate the ratio of oats to bran. They may help you estimate how much more or less of each grain is needed. For example, in the bowl shown, you can see that the bar representing oats (on the left) is slightly taller than the bar for the bran (on the right).

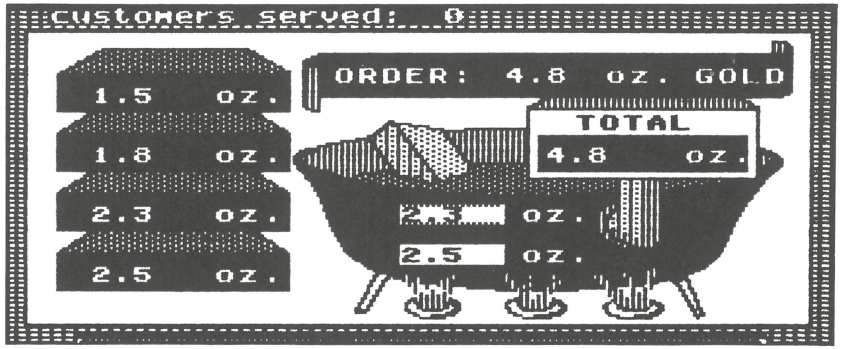
What Else Is in Store?
At first you will use one brand of cereal for your customers. But, before long, you will be using two brands of cereal, each with a different mixture of oats and bran. This will make your job a lot trickier!

Job Skills
Solving equations with two variables
Understanding ratio and proportion

The Jewelry Store
Heart of Gold Jewelers is not your average jewelry store. Here, gold is sold in very specific amounts. Tenths, hundredths, and thousandths of ounces mean a big deal. But the jeweler sometimes misses the fine points, and golden opportunities are lost.

Your Job
Your job is to choose the gold bars that, when melted together, will produce the exact amount of gold that the customer needs.

Here's a sample order for gold:



What Happens
On the top of the screen, you'll see the customer's order. The customer in the example needs 4.8 ounces of gold. On the left, you'll see four gold bars to choose from. The weight of each of the bars is stamped on its side. In the example, the bars weigh 1.5 ounces, 1.8 ounces, 2.3 ounces, and 2.5 ounces.

What You Figure Out
The melting pot contains enough room for two bars. Which two gold bars will weigh 4.8 ounces when melted together?

What You Do
In the melting pot, type in the weights of both of the bars you've selected. The meter outside of the melting pot will display the total number of ounces in the pot. The example shows 4.8 ounces. Be sure to press Return to enter each weight, and then press the Space Bar to complete the order.

Checking Your Work
To complete an order correctly, make sure the total matches the customer's order. In the example, the 4.8 ounces on the meter is the same amount that was requested by the customer.

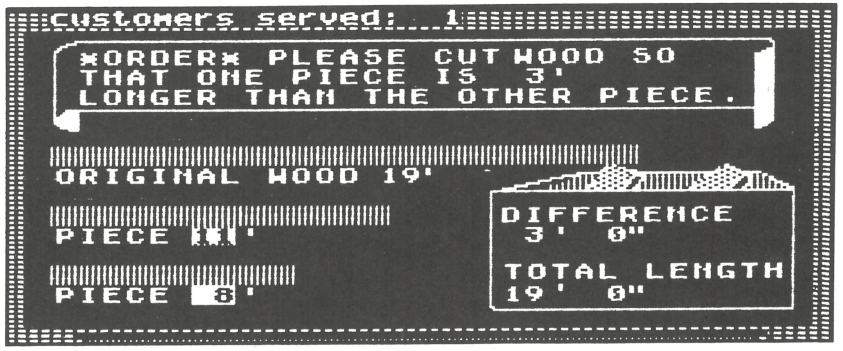
What Else Is in Store?
As you continue to work in the jewelry shop, you'll see that orders come in for very precise amounts of gold - for example, as specific as 1.234 ounces. With an order this precise, you'll need to be extra careful in preparing the gold.

Job Skills
Adding and subtracting decimals
Estimating

The Lumber Store
At the World of Lumber, the workers go to great lengths to keep customers happy. Customers are especially grateful for the Lumber Store's special sawing service. They can get their lumber in pieces of any size. The long and short of it is that having lumber cut to the exact length makes the customers' carpentry jobs much easier.

Your Job
At the lumber shop, your task is to cut wooden boards into two pieces. Customers will tell you how long to cut each one. Be sure to measure carefully!

Here's what you'll be doing on the job:


customers served: 1
ORDER PLEASE CUT WOOD SO THAT ONE PIECE IS 3' LONGER THAN THE OTHER PIECE.
ORIGINAL WOOD 19'
PIECE 11'
PIECE 8'
DIFFERENCE 3' 0"
TOTAL LENGTH 19' 0"

What Happens
At the top of the screen, you'll see the customer's request. In the example, the customer needs his board cut into two pieces - one piece 3 feet longer than the other piece. You will also see a bar representing the length of the customer's board. In the example, it's 19 feet long.

What You Figure Out
How long should each of the pieces be?

What You Do

Next to the labels for each piece of wood, type in the length you want them to be cut. Press Return. Bars representing each length will automatically appear. In the example, the 19-foot board would be cut into one 8-foot piece and one 11-foot piece. The box on the right will display important information about the two pieces. The DIFFERENCE shows the difference between the lengths of the two pieces, and the TOTAL LENGTH shows the length of both pieces together. (When the difference is calculated, it doesn't matter whether the top or bottom piece is longer.) When you've entered the lengths for both pieces, press the Space Bar.

Checking Your Work

The bars on the screen show you the lengths of the pieces. As you work, use the bars as a guide for estimating the lengths of the pieces you are cutting. To check your work, make sure that the difference displayed on the storage box matches the one shown in your customer's order at the top of the screen. In the example, the difference is 3 feet. Also, make sure that the total length of the two pieces is the same as the length of the wood. In the example, the original length is 19 feet.

What Else Is in Store?

After serving several customers, you will be required to make more precise measurements. Eventually, you will be counting both feet and inches as you work with the lumber.

Job Skills

Problem solving
Working with measurements

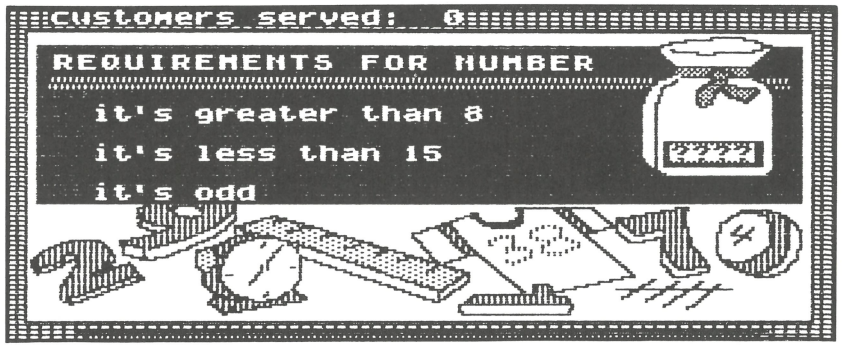
The Number Shop

At Numbers Unlimited, wishy-washy customers are overwhelmed by the endless array of numbers to choose from. Each customer wants to buy just one number, but can't decide which one. A math-minded helper like you could really help.

Your Job

Customers come into the number shop with a list of number requirements. You must examine each list, and come up with a number that matches all of the requirements.

See if you can find a number for this customer:



What Happens

The customer's list of number requirements will appear at the top of the screen. The list in the example shows that the number must be an odd number between 8 and 15.

What You Figure Out

What number meets all of the requirements? Keep in mind that there may be more than one solution!

What You Do

Type a number in place of the ???? in the bag. Press Return to enter it. When you've entered the number, a check mark will appear next to each requirement on the list that is satisfied by that number. When all requirements are checked off, press the Space Bar to complete your work.

Checking Your Work

Often, there's more than one number that will fit the bill. For the customer in the example, there are three possibilities: 9, 11, or 13. Luckily, it's easy to check out a possible solution. To see if a number matches all of the items on the list, just enter the number, and press Return to check the check-marks on the list.

What Else Is in Store?

Your job will become even more challenging when customers appear with lists of four and five number requirements.

Job Skills

problem solving
understanding these terms:

- multiples
- greater than
- less than
- factor
- remainder
- digit

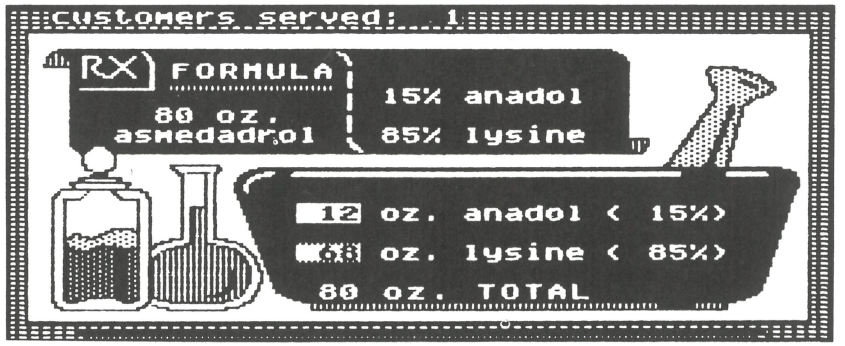
The Pharmacy

There's serious work to be done at the Pharsical Pharmacy. Here, customers bring in prescriptions for various types of medicine. But the percentages in the prescriptions are perplexing for the poor pharmacist. Please assist him. This is no place for mix-ups!

Your Job

You must fill each prescription by following the pharmacist's formula.

Here's a look at one customer's prescription:



What Happens

For each customer, the formula at the top of the screen will show the name of the medicine (asmedadrol), the amount needed (80 ounces), the ingredients (anadol and lysine), and the percent of each ingredient (15 percent and 85 percent). In the example, the customer wants 80 ounces of asmedrol. The formula for asmedrol is listed as 15 percent anadol and 85 percent lysine.

What You Figure Out

How many ounces of each ingredient should be mixed to make the proper amount of medicine?

What You Do

Next to each ingredient in the mixing bowl, type in the number of ounces you need. Press Return to enter each number. The percentages listed for each ingredient in the bowl will be calculated for you, and the calculation will appear on the right side of the screen. In addition, the total on the bottom of the bowl will show the total weight of the mixture. When the prescription is ready for the customer, press the Space Bar.

Checking Your Work

For the customer in the example, the correct solution is 12 ounces of anadol and 68 ounces of lysine. To check your work, make sure that the percentages of each ingredient match the original formula. In this case, you can see that 12 ounces of anadol is 15 percent of the mixture in the bowl, and 68 ounces of lysine is 85 percent of the mixture in the bowl - just what the prescription called for.

You can also check the total shown at the bottom of the mixing bowl. This number should equal the total number of ounces shown in the formula. In this case, 80 ounces of asmedadrol were requested, and 80 ounces were made.

What Else Is in Store?

The first prescriptions you'll make will require mixing two ingredients. As you continue working, you'll need to mix three or four ingredients for each customer.

Job Skills

Working with percents

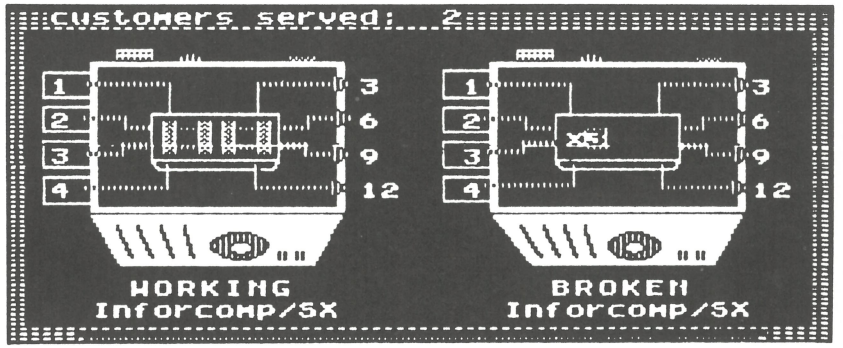
The Repair Shop

At All the Fixin's Repair Shop, things do not compute. There are many broken computers that need to be fixed. But there's no one who can do the fixing. Can you lend a hand?

Your Job

To do your job, you must study the working computer on the left to figure out what's missing from the broken computer on the right. When you replace the missing numbers, the broken computer will be back in action.

Here's one successful repair job:



What Happens

You'll see that both computers operate on numbers - in the example, the numbers 1,2,3, and 4. These numbers are the input. When you first see the two computers, only the working computer is operating on the inputs. It produces an output of four numbers. In the example, the outputs are 3, 6, 9, and 12. As soon as you supply the missing number to the broken computer, it will also produce four new numbers.

What You Figure Out

The inside of the broken computer will show you an equation with a missing number. Instead of the number, you'll see a question mark.

What You Do

In the broken computer next to the multiplication sign, type in the number that will complete the equation correctly. Look at the working computer to help you figure it out. In the example, 1, 2, 3, and 4 were multiplied by the same number to produce 3, 6, 9, and 12. If you can figure out what that missing number is, you have the solution for fixing the broken computer on the right. After you've typed in the missing number, press Return to enter it. Then press the Space Bar to check your work.

Checking Your Work

Your work is correct when the output from the broken computer matches the output from the working computer. As shown in the example, **3** was typed into the broken computer to produce the desired output.

What Else Is in Store?

After several repair jobs, your task becomes much more difficult. You'll need to complete equations with two missing variables. For those who manage the work, another challenge is added later. The inputs (1, 2, 3, and 4) are replaced by larger numbers, making each repair job even tougher.

Job Skills

Problem solving
Solving equations using one variable

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